

Claims

We claim:

Claim 1. While a conventional flotation treatment of water comprises:

- a. an addition of surfactants to said water in order to stabilize later gas bubbles
- b. an optional addition of surfactants-promoters of flotation to said water
- c. a formation of said gas bubbles within said water
- d. further stabilization of said gas bubbles by said surfactants adsorption
- d. a collection of contaminants by an adhesion to said gas bubbles
- e. a rise of said gas bubbles with attached said contaminants to a top of said water
- f. a froth formation on said top of said water said froth containing collected contaminants
- g. a removal of said froth for further treatment

a claimed method of water treatment from polluting agents or contaminants for drinking or for any other purpose comprises:

- a. an optional addition of surfactants-promoters of flotation to said water
- b. a formation of said gas bubbles within said water
- c. a collection of said contaminants by an adhesion to said gas bubbles
- d. a rise of said gas bubbles with said pollutants attached to a top of said water wherein said gas bubbles decay and release said contaminants
- e. an accumulation of said contaminants within a top water layer

wherein said gas bubbles formation within said water results from any of the following:

- f. previously dissolved within said water under normal atmospheric pressure gas means said gas bubbles formation is caused by stirring, or disturbances, or any other turbulences within said water
- g. a pressurization – depressurization cycle means in said pressurization – depressurization cycle gas is initially dissolved within said water under a substantial pressure and a formation of said gas bubbles is caused by later said substantial pressure decrease
- h. some chemicals addition to said water means said chemicals cause a reaction within said water in said chemical reaction gas molecules are released into said water
- i. by any combination of said turbulences, pressurization – depressurization cycle, and chemical reaction within said water

whereby comparing to a flotation the claimed process substantially increases a speed of contaminants removal from a body of the treated water.

Claim 2. A Separator to separate said top water layer with delivered and released contaminants in the process claimed by the Claim 1

means said Separator prevents or reduces a mixing of said top water layer with underlying water layers

whereby said Separator makes a process of said top water layer further treatment easier.

Claim 3. A Separator to separate said top water layer as it is claimed by the Claim 2 means said Separator allows said gas bubbles to rise through said Separator but said Separator prevents or reduces a turbulent mixing of said top water layer with underlying water layers

whereby said Separator enables said top layer to be immobilized or to move slowly comparing to said water thus allowing a further concentration of removed contaminants within said top water layer.

Claim 4. A method to treat water by a Separator claimed by the Claim 3 for a flotational treatment of said top water layer

means said gas bubbles within said Separator are stabilized by surfactants addition and collected by said gas bubbles contaminants are later removed from said water with froth

Claim 5. A process as it is claimed by the Claim 1 wherein said top water layer enriched with said contaminants is separated and removed from a main body of said water for further treatment

Claim 6. A process as it is claimed by the Claim 1 wherein accumulated within said top water layer contaminants further aggregate together and later said aggregated contaminants return to said water

whereby making a process of said water further treatment easier.

Claim 7. A process as it is claimed by the Claim 1 wherein accumulated within said top water layer contaminants further aggregate together and said top water layer is later removed with these aggregated contaminants

whereby making a process of said top water layer further treatment easier.

Claim 8. A process as it is claimed by the Claim 1 wherein
accumulated within said top water layer contaminants further aggregate
together, said aggregated contaminants r continue to grow in size until large
flocks of contaminants are formed

said flocks further precipitate to either a bulk of said water or to any designated
site of accumulation forming a precipitate

said flocks, or precipitate, or any combination of said flocks and precipitate are
later removed by any known method

whereby said water treatment from contaminants does not require an addition of
chemicals.

Claim 9. A Separator to separate precipitating flocks of contaminants in the process
claimed by the Claim 8

means said Separator allows said gas bubbles to rise through said Separator

but said Separator prevents or reduces a turbulent mixing of said top water
layer with underlying water layers

and said Separator collects precipitated flocks of contaminants

whereby said Separator does not allow said precipitated flocks of contaminants
to return to said main water body and thus makes a process of further removal
of said precipitated flocks of contaminants easier.

Claim 10. An Apparatus for a continuous treatment of water by the method claimed in
the Claim 1, or by a Gas Assisted Flotation, or by a Dissolved air Flotation

said Apparatus comprising one or more of not necessarily vertical shafts, pipes,
tunnels, chambers, or any other similar vessels said water eventually flows by,
said vessel or vessels constitute a flotation Unit with a water tower within said
flotation Unit,

said water initially contains dissolved under a substantial pressure gas

and said water enters a lower part of said flotation Unit and rises by flowing
through said water tower, and said water within said water tower maintains a
substantial pressure at a bottom of said flotation Unit

means while said water rises by moving through said flotation Unit the
pressure within said water decreases and causes gas bubbles formation within
said flotation Unit from previously dissolved gas molecules

and within said flotation Unit said contaminants are attached to said gas bubbles, said gas bubbles further rise and take contaminants with them, and deliver these attached contaminants to a top water layer

whereby contaminants are removed from a main water body and a productivity of this Apparatus allows to treat large volumes of water.

Claim 11. An Apparatus as it is claimed by the Claim 10

wherein said water prior to entering said flotation Unit enters and later flows by some Gas Dissolution Unit

means within Gas Dissolution Unit molecules of said gas are dissolved within said water under a predetermined pressure

and an exit of said Gas Dissolution Unit is connected to an entrance of said flotation Unit either directly or through some connecting shaft, tunnel, pipe or a plurality of any vessels said water flows by

whereby making it possible to treat pressurized water without a substantial concentration of dissolved gas within said water.

Claim 12 An Apparatus as it is claimed by the Claim 11 wherein only a first part of said water flows through said Gas Dissolution Unit

wherein another part of said water is mixed with said first part only after said first part leaves said Gas Dissolution Unit and prior to a rise of said water through said flotation Unit

whereby increasing a volume of treated water.